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Remarks

Claim amendments

Independent claims 5 and 9 have been amended to more accurately describe the geometric shape of the chamber. The amendments are fully supported by the specification, see, for example, Figures 3, 9 and 16. No new matter has been added by the amendments. Entry of the amendments is respectfully requested.

Claim rejections under 35 U.S.C. § 103

1) Claims 9-12 and 17-24 were rejected under §103(a) over Lehmann, EP 1161984 in view of Sharpe, US 2004/0207840. The rejection is respectfully traversed.

Claim 9 is an independent claim. Each of the claims 10-12 and 17-24 depends ultimately from claim 9.

The examiner stated that Lehmann teaches a vessel that "includes a tubular body (Figure 1:15)." Lehmann does not expressly state that the chamber is in the shape of a cuboid having side lengths which are substantially equal, but Sharpe teaches a cuvette that is generally cuboid and square in cross-sectional shape. The examiner concluded that "it would have been obvious to modify the chamber disclosed by Lehmann so that it is in the form of a cuboid, having side lengths which are substantially equal."

In fact, Lehmann does not teach or suggest tubular chambers. Contrary to examiner's statement, the chamber (15) on Figure 1 of Lehmann is not tubular but flat. The Applicants have previously supplied a dictionary definition of "tubular" or "tube" as "hollow elongated cylinder". As is clear from every figure of Lehmann, the chamber is rectangular in all cross-sections. Both the inner and the outer walls of the chamber lack any curvature. In Lehmann, the rectangular walls are of unequal length, but Sharpe discloses a rectangular cuvette where the length and width of the chamber are equal. Clearly, neither Lehmann, nor Sharpe, nor their combination teach a vessel with a tubular (cylindrical) chamber.

Although the Applicants do not agree with the examiner's interpretation of Lehmann or that the existing claims read on Lehmann, the claims are amended in order to further prosecution. The amendments more clearly describe the invention. As amended, claim 9 recites a "straight tubular chamber ... having an outer shape of approximately a cuboid". Notably, in the prior version of the claim, the chamber was already inherently straight and tubular since it was described as formed by the walls of a "straight tubular

body". The terms "having an outer shape of approximately a cuboid", are another attempt to describe an unusual shape of the device (*see e.g.* Figures 3, 9 and 16). According to the dictionary definition, of "tubular" means cylindrical. Since a cylinder and a cube are distinct geometric shapes, the same chamber may normally not be a cylinder and a cube at the same time. Realizing that the prior amendment created confusion, Applicants now clarify that the chamber is cylindrical *on the inside* but has a shape closer to a cube *on the outside*. This fact is clearly shown in cross-sections on Figs. 3, 9 and 16.

In view of the amendments, the prior art must teach or suggest a tubular chamber that has an outer shape of approximately a cuboid. Specifically, a person of ordinary skill must have a reason to so modify the shapes of the chambers taught by either Lehmann or Sharpe.

MPEP teaches that if proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *See* MPEP 2143.01(V), citing *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

In fact, a tubular chamber is incompatible with the intended purpose of both devices. In Lehmann, the purpose of the vessel is to contain a flat rectangular chip (Fig. 1). The chamber must then fit into a flat rectangular slot of a processing apparatus (Fig. 5). Lehman states that it is essential that the surfaces of the chip, the chamber and the slot be co-planar (*see* [0035]). This would not be possible if the chamber is tubular. A further drawback of the tubular chamber would be reduced volume. The volume of a cylinder is smaller than the volume of a rectangular prism with a side equal to the diameter of the cylinder¹. Similarly, in Sharpe, a tubular chamber would impair the performance of the device. The cuvette is placed in the path of light in order to measure optical density of the sample. If the cuvette is tubular, reproducible measurement would become impossible. If a tubular cuvette is placed slightly off center, the light would travel through less than a full diameter of the cylinder and give a smaller absorbance reading. Therefore the optimal shape of the cuvette is a rectangular prism. Changing it to a tube (cylinder) makes no sense.

In summary, a hypothetical combination of Lehmann and Sharpe would lack an essential feature of claim 9. Furthermore, a person of ordinary skill trying to optimize

¹ Compare the area of a square with a side 1 cm (1 cm^2) and a circle with a diameter 1 cm ($\pi \times (0.5)^2 = 0.785 \text{ cm}^2$)

either Lehmann or Sharpe would have no reason or motivation to modify rectangular chambers into the tubular chamber taught by the claim because it would ruin both devices.

In view of the foregoing, the Applicants respectfully request reconsideration and withdrawal of the §103(a) obviousness rejection over Lehmann in view of Sharpe.

Claims 10-12 and 17-24 depend ultimately from claim 9 and therefore incorporate all the limitations of that claim. As discussed above, Lehmann, Sharpe or their combination do not disclose or suggest the device described in claim 9. Therefore obviousness rejections of the claims dependent on claim 9 over Lehmann in view of Sharpe may not be sustained. Reconsideration and withdrawal of the rejections are respectfully requested.

2) Claim 5 was rejected under §103(a) over Lehmann in view of Sharpe and Combs (US 4,812,294). The rejection is respectfully traversed.

The examiner stated that the combination of Lehmann and Sharpe discloses the reaction vessel but not the vessel holder capable of moving along a predetermined elliptical trajectory. Combs teaches that "the vessel holder is moved along a predetermined trajectory for causing mixing of fluids within the vessel."

Like claim 9, claim 5 has been amended to recite "straight tubular chamber ... having the outer shape of approximately a cuboid". As discussed in relation to claim 9, neither Lehmann nor Sharpe nor their combination teach a tubular chamber that would have an outer shape of approximately a cuboid. Combs discloses centrifuge wells ("vessels") that are entirely tubular and do not have an outer shape of approximately a cuboid. Combs does not teach or suggest the limitation missing from Lehmann and Sharpe. Therefore a §103(a) rejection is improper for this reason alone.

As to the vessel holder, in Combs, the centrifuge wells are placed in vessel holders and move along a predetermined trajectory. However, the trajectory is not elliptical but perfectly circular. As quoted in the preceding section, a modification is not obvious if it would render the prior art unsatisfactory for its intended purpose. See MPEP 2143.01(V). In fact, it is an axiom of physics that any deviations from the circular trajectory disrupt the centrifugal process and at high speeds even destroy the sample and the apparatus. Therefore a person of ordinary skill would not be motivated to spin the Combs' centrifuge along the elliptical path taught by the Applicants.

Furthermore, although Combs device may be classified as "sample processing", it serves a purpose opposite to the purpose of the Applicants' device. The purpose of the centrifuge is separating components of a solution. "Centrifuge" is defined as "an apparatus that rotates at high speed and by centrifugal force separates substances of different densities, as milk and cream." (See Dictionary.com on-line dictionary). In contrast, the Applicants' invention expressly teaches optimal trajectory for effectively mixing the substances. (See p. 11, lines 19-27). Therefore a person of ordinary skill would not have consulted Combs for the purpose of designing a vessel holder and the trajectory for the vessel holder.

In summary, a hypothetical combination of Lehmann, Sharpe and Combs is lacking at least two separate limitations of claim 5. Neither of the references nor their combination suggests the missing limitations. Furthermore, Combs reference may not even be a part of the hypothetical combination because it describes a device with a contrary purpose. Based on the foregoing, reconsideration and withdrawal of the §103(a) rejection of claim 5 are respectfully requested.

3) Claims 6-8 were rejected under §103(a) over Lehmann in view of Sharpe, Combs and further in view of Frackelton (US 5,133,937). The rejection is respectfully traversed.

The examiner stated that Lehmann, Sharpe and Combs disclose the apparatus of claim 5 as set out in the corresponding rejection of that claim. Frackelton teaches a vessel, a vessel holder and various heat transfer elements.

Claims 6-8 depend from claim 5 and therefore incorporate all the limitations of that claim. As set forth in the preceding section, a hypothetical combination of Lehmann, Sharpe and Combs does not teach or suggest the Applicants' invention as described in claim 5. Frackelton teaches an analytical system with a removable cartridge. The cartridge is entirely flat, i.e. shaped as a narrow rectangle. There is no teaching or suggestion of a tubular cartridge. A rejection of the dependent claims under §103(a) is improper for that reason alone.

Frackelton teaches heating elements supplying heat to the cartridge. A tubular cartridge would be incompatible with the purpose of the Frackelton device: a flat side of the cartridge achieves maximum contact and maximum heat exchange inside the device. A tubular cartridge with a curved side would necessarily have a smaller contact area and inferior heat exchange properties.

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For the foregoing reasons an obviousness rejection of claims 6-8 over Lehmann, Sharpe, Combs, Frackelton or their combination is not warranted. Reconsideration and withdrawal of the §103(a) rejection are respectfully requested.

4) Claims 13-16 were rejected under §103(a) over Lehmann in view of Sharpe and further in view of Frackelton. The rejection is respectfully traversed.

With respect to claims 13-16, examiner stated that Lehmann and Sharpe teach the device described in claim 9 as set out in the corresponding rejection of that claim. Claims 13-16 depend directly or indirectly from claim 9. As explained above, a hypothetical combination of Lehmann and Sharpe does not teach or suggest the Applicants' invention as described in claim 9. Therefore rejection of the dependent claims under §103(a) is improper for that reason alone.

Claim 13 teaches electro-optical detection of the sample through a transparent zone in the reaction vessel. Frackelton discloses a transparent acrylic plate for visual observation of the liquid in the cartridge. At the same time, the acrylic plate is being heated. Heating and steaming up of the acrylic would likely preclude accurate electro-optical detection taught by the present invention. At the same time, simple observation desired by Frackelton would still be possible. Therefore Frackelton does not teach or suggest a device capable of electro-optical detection.

Claims 14-16 teach heating elements in connection with the reaction vessel. Frackelton discloses heating and cooling elements in connection with the flat cartridge. As explained above, a tubular vessel of the present invention would not be compatible with the Frackelton device. Therefore a person of ordinary skill would have no reason to modify the Frackelton cartridge into a vessel of the present invention.

For the foregoing reasons an obviousness rejection of claims 13-16 over Lehmann, Sharpe, Frackelton or their combination is not warranted. Reconsideration and withdrawal of the §103(a) rejection are respectfully requested.

5) Claim 25 was rejected over Lehmann in view of Sharpe and further in view of Mochida (GB 2129551). Mochida discloses a bar code label placed on the wall of a vessel holding a sample. The rejection is respectfully traversed.

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The examiner stated that Lehmann and Sharpe teach the device described in claim 9 as set out in the corresponding rejection of that claim. Claim 25 depends from claim 9. As explained above, a hypothetical combination of Lehmann and Sharpe does not teach or suggest the Applicants' invention described in claim 9. Mochida does not cure this deficiency. Therefore reconsideration and withdrawal of the §103(a) rejection of claim 25 over Lehmann in view of Sharpe and further in view of Mochida are respectfully requested.


Conclusion:

It is believed that claims as amended are in condition for allowance. The Commissioner is hereby authorized to charge the one-month extension of time fee (large entity) under 37 CFR 1.17 to Account No. 50-0812. The Commissioner is further authorized to charge any fee deficiency, or credit any overpayment, to Deposit Account No. 50-0812.

If the Examiner believes that a telephone conference would expedite prosecution of this application, he may telephone the undersigned directly at 510-814-2706.

Respectfully submitted,

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